



Innovative Coding and Printing Solutions



WEB ADVANCE SYSTEM (WAS)

Operator's Manual



Innovative Coding and Printing Solutions

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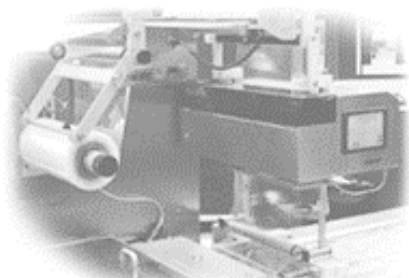
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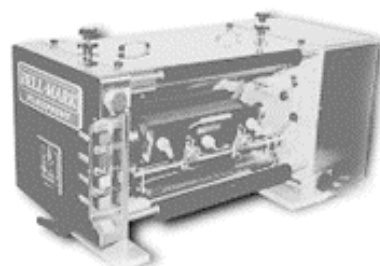
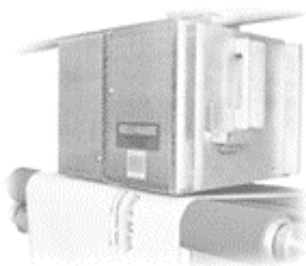
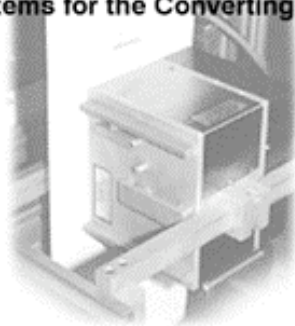
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SAFETY

Before working on the printer, please read this section thoroughly. Always

SAFETY FLAGS

Throughout this manual we will use the following graphic symbols: **CAUTION** and **WARNING** to alert the operator to any and all known or perceived safety concerns.

CAUTION

THIS SAFETY WARNING POINTS OUT AREAS THAT CAN CAUSE PERSONAL INJURY OR DAMAGE TO THE MACHINE.

WARNING

THIS SAFETY WARNING POINTS OUT AREAS THAT CAN CAUSE SERIOUS INJURY.

- **Do not operate this machine while under the influence of alcohol or other mind slowing drugs.**
- Use the safety covers that are installed on the printer.
- **Do not attempt to defeat the safety switches and equipment interlocks.**
- Keep your fingers away from the printer's moving parts during operation.

- **Disconnect electrical power and pneumatic supplies before performing services or repairs on the printer.**
- Do not wear loose clothing, such as neckties or shirts with loose sleeves.
- **Do not wear jewelry such as rings, necklaces or bracelets when working on the printer.**
- Pull back and tie long hair that might get caught in the machine.

We have endeavored to make this instruction manual as accurate as possible. Illustrations, photographs and text have been carefully checked.

All instructions should be read, carefully studied and understood before attempting operation, maintenance or repair of the equipment described herein. If there is a question regarding any of the information presented here, please call 717-292-5641 or FAX 717-292-5686 and request Technical Support.

Due to the variability of local conditions, customer procedures and operator skill levels, neither the authors, nor Bell-Mark Corporation assumes any responsibility for any accidents; injuries, damages or other losses incurred resulting from the material presented in this manual.

GENERAL DESCRIPTION OF THE WEB ADVANCE SYSTEM

The Bell-Mark Web Advance System (WAS) is a state-of-the-art, PLC-controlled, in-line web sub-indexer. The WAS is useful in many printing applications where multiple print positions are needed during the packaging machine dwell cycle. A typical application is using this unit in conjunction with the EasyPrint MLP, mounted on a horizontal form/fill/seal packaging machine. (these might include machines manufactured by Dixie™, Hooper™, Mahaffy & Harder™, Multivac™, Prime Equipment™, and Tiromat™). The WAS is sold in two standard widths: the Model 440, and the Model 630. Custom widths are available.

Let's look at an example of a typical WAS application. The EasyPrint MLP thermal transfer printer prints on the web when it is stationary (between packaging machine indexes). A Model 128 MLP (normally printing across the web) uses a printhead that provides a maximum printed image height (in the direction of web movement) of about 5". For applications where the image height exceeds this value, or where more than one row of images is to be printed between indexes, there are several approaches that may be taken.

If space allows, multiple (stacked) printers may be mounted at the appropriate spacing. This configuration has the advantage of allowing simultaneous printing of several rows, shortening the printing time, and allowing a high packaging machine index rate. Another approach to this application would be to move the entire printer (shift it up and/or down during the stationary portion of the index cycle) to print the desired number of rows. This requires a mounting bracket and shift mechanisms that can quickly and accurately move the MLP, an approach that requires a considerable amount of mounting space. A more effective approach is to provide a mechanism that allows for sub-indexing of that portion of the web that requires the multiple row printing. This can be accomplished by installing the Bell-Mark Web Advance System (WAS) onto the MLP.

The WAS provides a method of sub-indexing or moving the web independently of the packaging machine index (between index cycles) such that the portion of the web that requires printing is positioned at the MLP platen at the proper time. The illustration on the following page (Figure 1) shows a WAS being mounted to the back of an MLP, and the accompanying diagram (Figure 2) illustrates how the new web path through the WAS allows the print location on the web to be shifted. The WAS allows for multiple rows of printing by storing a complete index web length on an internal array of rolls (in a serpentine state to conserve space), and shifting these rolls during the packaging machine dwell cycle to present specific areas of the web to the MLP for printing. The WAS has its own control system, which synchronizes the web material movement with the movement of the MLP's printhead carriage, as well as with the packaging machine index cycle. Stepper-motor driven ball screws provide this dual-roll movement.

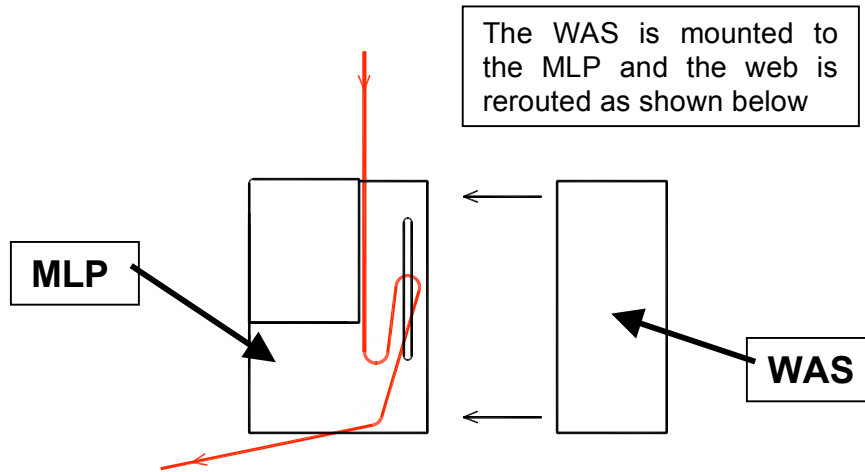
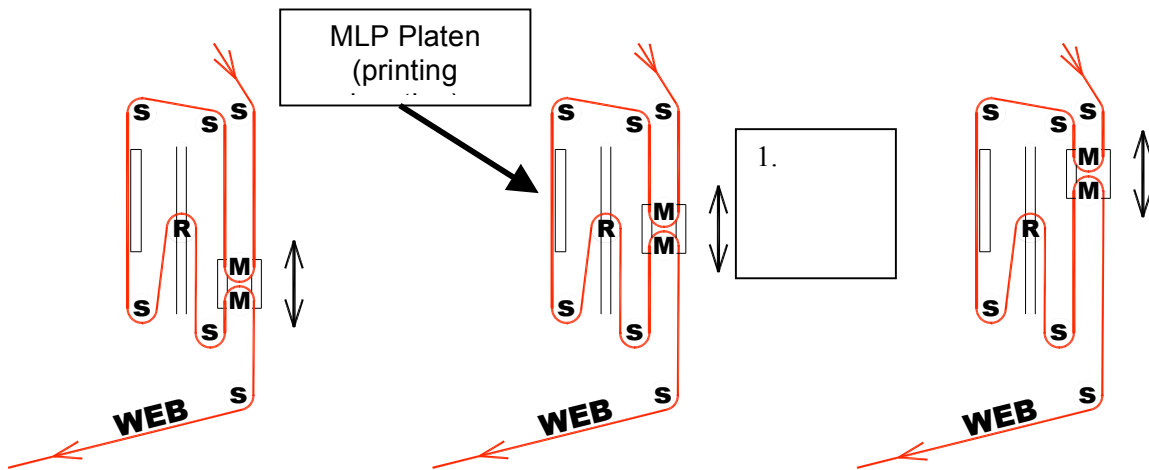


Figure 1 – Adding the WAS to the MLP

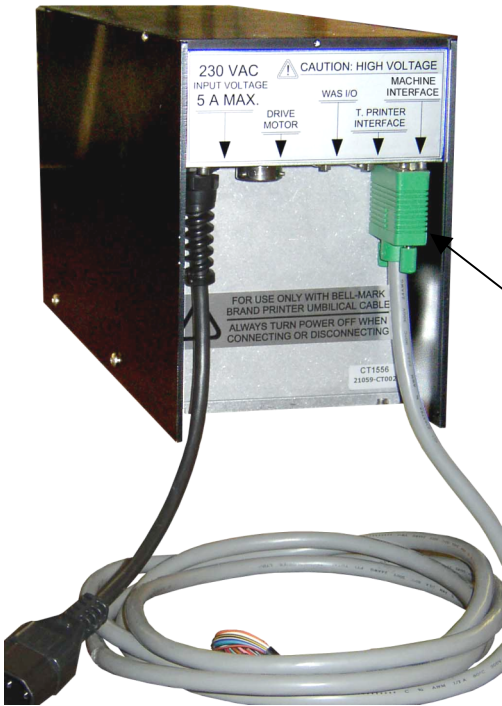


S = Stationary Rolls R = Registration Roll M = Moveable Rolls

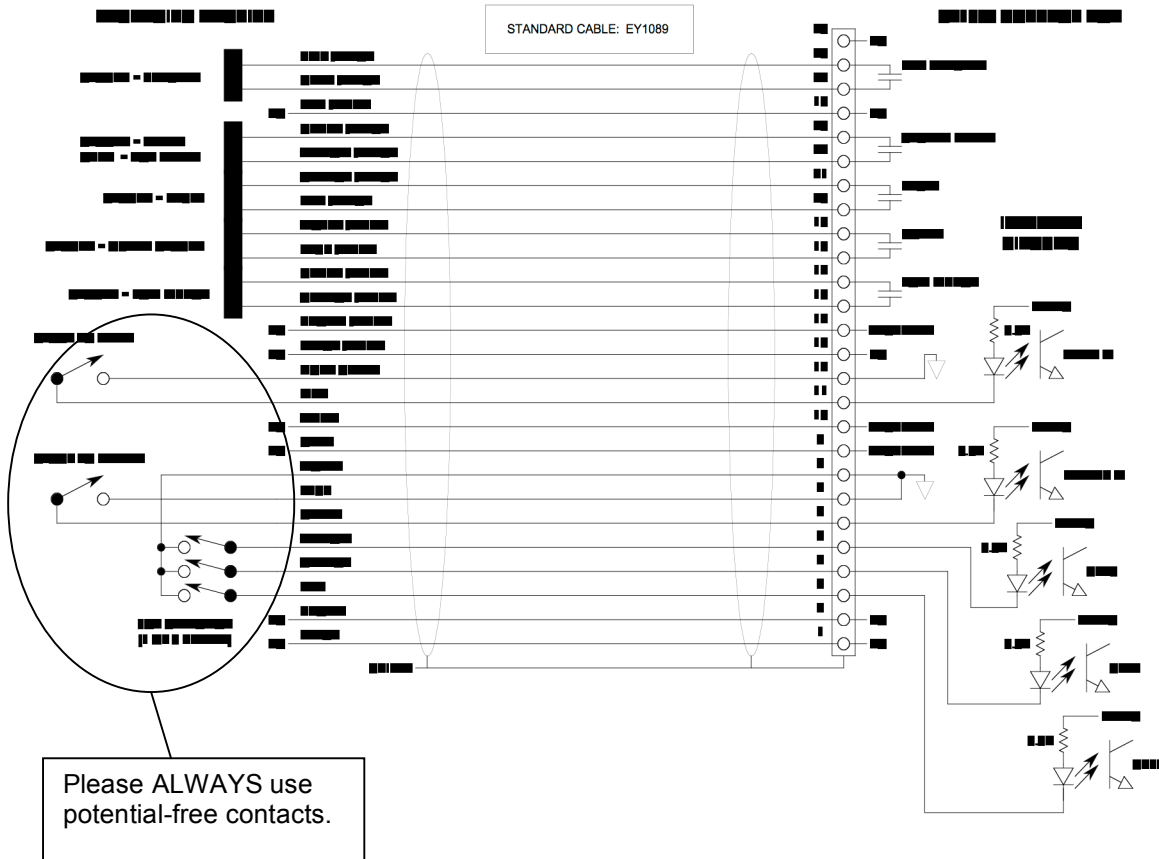
Figure 2 – How the WAS Sub-Indexes the Web

Depending upon your specific application, the WAS roll carriage may provide sequential print moves in only one direction during a dwell cycle (e.g. moves in the upward direction during a dwell cycle, and downward during the next dwell cycle), or it may only print during the “up” cycle, returning to a home position (down) during the packaging machine index.

ELECTRICAL CONNECTIONS

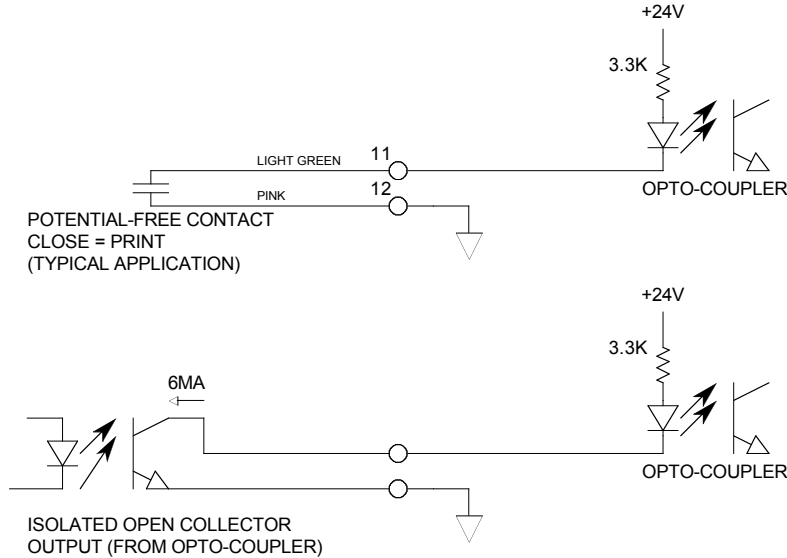


Bell-Mark EY1089 Interface Cable attached to WAS control box

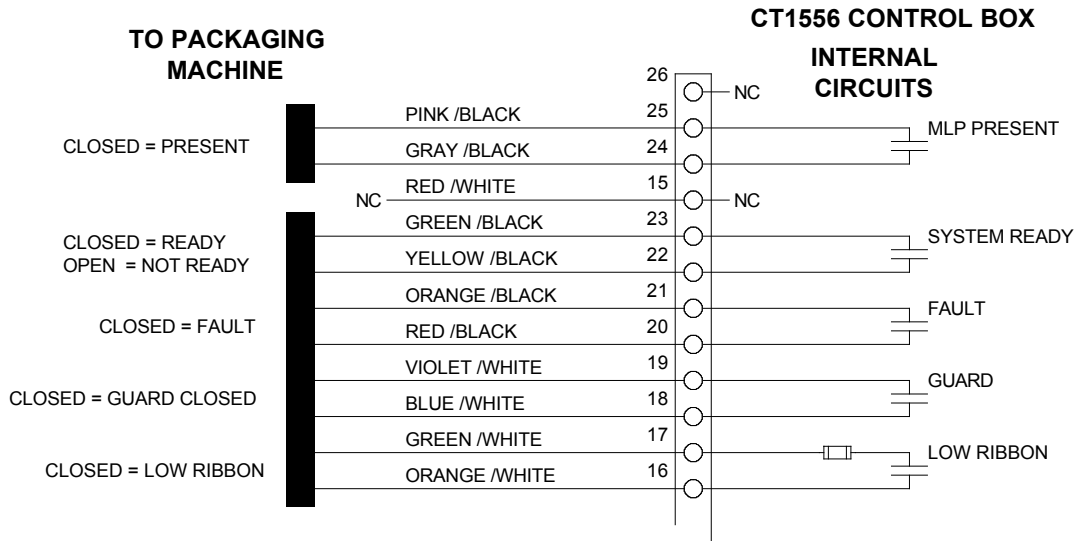


WAS Inputs (continued)...

Here are 2 example ways to connect to the Bell-Mark inputs (the Print Input is used in these examples):



WAS Outputs



WARNING

Never use these contacts to control 120 or 240 volt circuits.

1. All outputs are potential-free relays contacts - 5 ampere max rating.
2. Each The voltage that is switched by these contacts should be kept low, such as 24 volts.
3. Only the **Low Ribbon** output circuit contains a overcurrent protection device:
 - 1 ampere nominal rating
 - automatically self-resetting

WAS CONTROL DESCRIPTION

A. Machine Guard Safety Interlock

The WAS (Web Advance System) control system is designed with operator safety as a primary functional criteria of the device. The Lexan™ guard is provided to allow the operator access into the machine for the purposes of threading the web material through the system. There are two positive make/break interlock switches, wired in series, with dual independent circuits and keyed operators. One of the circuits is used by the WAS to control the web advance system. When the guard is removed, power to the motor drive is turned off, removing any threat to the operator. Program execution also stops and the display will read “**!! GUARD OPEN !!**”. When the guard is replaced the system re-energizes the motor drive and resets.

The second guard circuit is dedicated for use by the host machine control. A closed circuit indicates the guard is in place and the WAS is safe to operate.

WARNING

No attempt should be made to defeat the safety interlock system.

B. Operation

Power-up both control boxes. The display on the WAS control box (EY5008) will read:

WAITING FOR MLP

Load the label into the MLP control box (EY5007) from either a memory card or serial port. Once the label has been loaded and the MLP is ready (printmode), the WAS control will execute a homing routine to establish the start position. The display will read:

Once the homing routine is completed, the display should read:

SYSTEM READY
PRESS F1 TO EDIT

The system is now ready to accept a print signal from the host machine control. This is the only time where web advance data can be reviewed and/or edited. See the Section named “Changing Web Advance Data” later in this write-up.

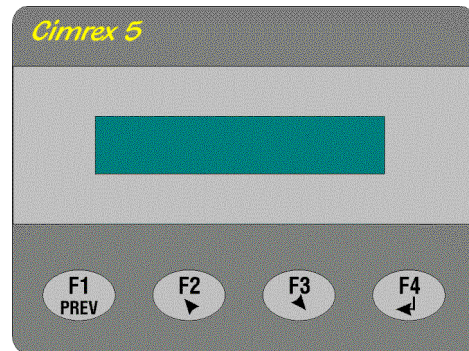
The Printing Sequence

Upon receipt of a print signal from the host machine, the WAS control issues a print signal to the MLP control. Once the first row has been printed, the web advance moves the web the programmed distance as the MLP is returning. This sequence is repeated until the number of print passes is equal to the print pass data entered into the data input terminal. When the MLP has completed the last print pass, the WAS control issues a ready signal to the host machine control indicating that the print sequence has been completed. The system is now ready to accept another print signal from the host machine.

After the first print cycle and upon the next print command, the web advance travels in the opposite direction, eventually returning to the original home position during the second print cycle. The system then re-validates the home position to the sensor. This continues in an alternating fashion every other print cycle.

C. Data Input Terminal

The data input terminal is a dual function device. It provides a means by which data can be changed and also functions as a machine status indicator. The data input into the terminal is used by the WAS control to calculate the web move distance and print spacing.



Motion Parameters (see also *Job Selection* below)

There are three parameters involved in the motion of the web advance system. The first parameter is the number of print rows or *passes* per host machine feed. The second parameter is the host machine web-feed distance. This is the length of web fed by the host machine in millimeters. The data placed in the terminal **must** match the data in the host machine in order for the desired print spacing to be accurate. The third parameter is the home offset in millimeters.

Adjusting Web Advance Parameters

Data can only be changed when the host machine is in the **Stop Mode** and the display reads:

**SYSTEM READY
PRESS F1 TO EDIT**

Press **F1** to enter the view/edit mode. The first parameter to be displayed is the number of print passes. The display will read:

**PRINT PASSES X
PRESS F1 TO EXIT**

To exit without changing data, press **F1**. To change the displayed data, press **F4**. The display will read:

**PRINT PASSES [X]
PRESS F1 TO EXIT**

Brackets are drawn around the value and the cursor flashes below the number. Use the **F2** key to increase or the **F3** key to decrease the number until the desired value is reached. When satisfied, press the **F4** key. The display will read:

**PRINT PASSES X
PRESS F1 TO EXIT**

Now press **F1** to exit the print passes screen. You now enter the web-feed distance screen. You may now view/edit the web-feed distance data. The display will read:

**DISTANCE XXX mm
PRESS F1 TO EXIT**

To exit without changing data, press **F1**. To change the displayed data, press **F4**. The display will read:

**DISTANCE [XXX]mm
PRESS F1 TO EXIT**

Brackets are drawn around the value and the cursor flashes below the number. Use the **F2** key to increase or the **F3** key to decrease the number until the desired value is reached. The rate at which the value changes is proportional to how long the key is depressed. The longer the **F2** or **F3** key is depressed, the faster the value changes. Remember that this value must equal the programmed feed distance of the host machine in order for the desired print spacing to be accurate. When satisfied, press the **F4** key. The display will read:

**DISTANCE XXX mm
PRESS F1 TO EXIT**

Now press **F1** to exit the distance screen. You now enter the offset screen. You may now view/edit the offset data. The display will read:

**REG OFFSET XXX mm
PRESS F1 TO EXIT**

Use the **F2** and **F3** keys to adjust

Press **F1** to exit. The system now calculates the print spacing from the parameter data previously entered. The value of the print spacing is then displayed for approximately 2 seconds before returning to the system ready screen. The calculated print spacing screen appears as follows:

**CALCULATED PRINT
SPACING = XXX mm**

The system is now ready for operation.

One Print Pass

If only one print pass is needed, simply enter the value one (1) into the print passes data screen. Load the web-feed distance as usual; however, when 1 print pass is selected, the web-feed distance is ignored (since it really does not matter). The calculated print spacing is displayed based on the web-feed distance alone.

Limitations of Data Entry

Due to limitations of travel in the system, the following chart describes the interaction between the number of print passes, maximum web-feed distance and the maximum spacing of prints on the web material.

Number of Rows	Maximum Web Feed Length (mm)	Maximum Print Spacing (mm)
1	any	any
2	640	320
3	480	160
4	425	106
5	400	80
6	384	64

Data entry is limited, based on the maximum values as shown in the above chart. There is no way to enter invalid data, since based on the value of the number of print passes, the data input is limited to the maximum shown above. Whenever any data is changed, the system must also return to the home position. This occurs automatically without operator intervention.

Machine Status Display

As previously stated the data input terminal also functions as a machine status indicator. The display shows the status of the system as it proceeds through the printing sequence. This can be a valuable tool for troubleshooting, since each step of the sequence is displayed while being executed.

Faults

Over Travel Limits

Over travel limit switches have been provided at both ends of travel to protect the mechanical drive system. During web positioning, if either limit switch is activated, the drive motor is immediately stopped and the display will read "OVERTRAVEL LIMIT". *This fault is terminal and requires the cycling of power to the WAS control box to reset.*

Drive Over-temperature

This fault indicates the motor drive (located in the WAS control box) has exceeded the maximum operating temperature. The drive will shut down temporarily and the display will read "DRIVE OVERTEMP". This fault recovers automatically when the drive is at a safe operating temperature.

MLP Fault

When the MLP control does not respond to a print command, or exceeds the normal response time in which to print or return to the start position, an internal fault is generated, and all printing stops. Once the MLP is returned to ready or operational status, the system automatically recovers. It then completes the print command sequence instructed by the host machine, thereby completing the assigned printing task without missing a print. For example, with a broken ribbon fault, once the ribbon is re-threaded and the guard is closed, the system will finish the interrupted cycle until its completion.

D. Job Selection

The WAS can be programmed with up to 8 sets of parameters or *jobs*. Once a set of parameters are programmed, the "Job" can be easily selected using the Job Select control inputs. See *Electrical Connections*.

It may not necessary to use the Job Select feature. Leaving the inputs unconnected defaults to always Job 1.

When it's desired to program the parameters for different jobs, it is necessary to first select the job using the Job Select inputs.

E. Notes on MLP Set-up Parameters

In order to insure proper machine operation the following parameters **must** be set-up in the MLP control box under "Print Parameters".

1. ENABLE = ON (EPII only)
2. ENABLE OFF WHILE PRINTING (EPII only)
3. TRIGGER SIGNAL = LEVEL (EPII and EP32)
4. WEB ADVANCE = OFF (EPII only)

E. PERFORMANCE SPECIFICATION

Mechanical

Shuttle travel length = 150mm (5.90 in.) equivalent to a 300mm change of web position

Shuttle Maximum Speed = 320mm/sec, 640mm/sec Web Speed

Positioning Resolution = .04mm (.0015 in.)

Home Repeatability = +/- .15mm (.006 in.)

Electrical

Input Voltage = 220/240 VAC, 50/60 Hz., single phase. Voltage **must** be supplied through normally closed Emergency Stop contacts of the host machine. An emergency stop condition of the host machine shall cause a loss of power to the WAS control box.

Current Consumption = 3 AMPS Max. @230 VAC

Operating Temperature = 0 C – 45 C (32 F – 113 F)

Machine Interface = Potential-free (isolated) relay contacts rated 3 Amps @ 250 VAC

Operating Temperature = 0 C – 45 C (32 F – 113 F)

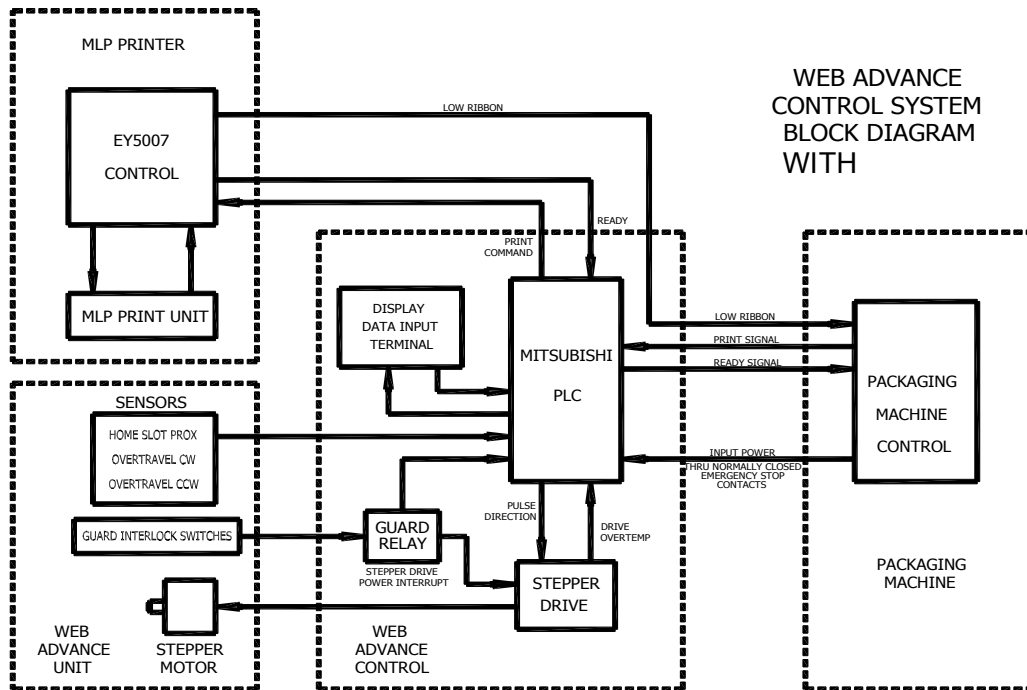


Figure 3 – Typical Web Advance System Control System Block Diagram

TECHNICAL SUPPORT

BELL-MARK

Since 1959, Bell-Mark has designed, manufactured and serviced high-performance coding, marking and printing products for the industrial marketplace. Our products are in use by over 15,000 companies throughout the world.

TECHNICAL SUPPORT

To schedule service calls or for Technical Support, call **717-292-5641**, or FAX **717-292-5686**

THE INTERNET

Visit Bell-Mark on the world wide web: <http://www.bell-mark.com/>. Our web site shows Coders and In-Line Printers for the Packaging Industry, Printers for the Converting and Extrusion Industry and, EasyPrint Thermal Transfer Printers. The site also includes information on Career Opportunities, Service, Trade Show participation, Distributors, and What's New.

SPARE PARTS AND CONSUMABLES

Bell-Mark is your reliable resource for consumables and spare parts. Contact Bell-Mark for ink, cleaning solvent, inking sleeves, rolls, printing plates, thermal transfer ribbon, belts, tubing and parts.

Although not a requirement, it is best to have a supply of spare parts on hand in the event of a shutdown emergency. To this end, a list of recommended and optional spare parts for your model printer will be shipped with this manual.

Once your preferred ink is determined, it would be advisable to have on hand a back up supply of ink and cleaner.

Bell-Mark sells an excellent hand cleaner that is perfect for removing our printing inks from hands.

To place an order for spare parts and consumable goods call Bell-Mark at **973-882-0202**.

APPENDIX

Application Notes:

- Typical estimated time to do a major index move t_i is: 0.5 secs.
- Typically, a minor index move t_x takes the same time or is faster than a printer carriage return t_{CR} . Thus, the time to do a minor index does not contribute to overall cycle time.
- The timing diagram shows SEALING and LOADING is completed before printing is done. Thus the cycle time is determined by printing rows. In applications where sealing or loading take longer than printing, their time(s) is what determines cycle time.
- Factory default forward speed is: 250 mm/sec
- Max forward speed is: 500 mm/sec for 53 mm printers
300 mm/sec for 128 mm printers
- Carriage return speed is: 650 mm/sec for all printers (factory default)

TRAVERSE PRINTING WITH THE WEB ADVANCE SYSTEM

Dwell & Cycle Times Estimation Matrix

Factory default forward print speed of 250 mm/sec (all models).

Dwell / Cycle times in seconds...

rows print width	1 (no minor index)	2	3
254 mm (10")	1.2 / 1.9	3.1 / 3.8	5.0 / 5.7
440 mm	1.9 / 2.9	4.8 / 5.8	7.7 / 8.7
600 mm	2.6 / 3.8	6.4 / 7.6	10.2 / 11.4

times are rounded up to next whole $\frac{1}{10}$ second

For high speed applications - 500 mm/sec, 53 mm (2") printer only

Dwell / Cycle times in seconds...

rows print width	1 (no minor index)	2	3
254 mm (10")	0.8 / 1.5	2.2 / 2.9	3.7 / 4.4
440 mm	1.1 / 2.1	3.2 / 4.2	5.3 / 6.3
600 mm	1.5 / 2.7	4.1 / 5.4	6.8 / 8.0

times are rounded up to next whole $\frac{1}{10}$ second

For high speed applications, 128 mm (5") printer - 300 mm/sec

Dwell / Cycle times in seconds...

rows print width	1 (no minor index)	2	3
254 mm (10")	1.1 / 1.8	2.8 / 3.5	4.5 / 5.2
440 mm	1.7 / 2.7	4.3 / 5.3	6.9 / 7.9
600 mm	2.2 / 3.4	5.6 / 6.8	9.0 / 10.2

times are rounded up to next whole $\frac{1}{10}$ second

Dwell Time & Cycle Rate Estimation Matrix

Factory default forward print speed of 250 mm/sec (all models).

Dwell time in secs / Cycle Rate per min...

rows print width	1 (no minor index)	2	3
254 mm (10")	1.2 / 32	3.1 / 16	5.0 / 10
440 mm	1.9 / 20	4.8 / 10	7.7 / 7
600 mm	2.6 / 16	6.4 / 8	10.2 / 5

times are rounded up to next whole $\frac{1}{10}$ second

For high speed applications - 500 mm/sec, 53 mm (2") printer only

Dwell time in secs / Cycle Rate per min...

rows print width	1 (no minor index)	2	3
254 mm (10")	0.8 / 42	2.2 / 21	3.7 / 14
440 mm	1.1 / 29	3.2 / 14	5.3 / 9
600 mm	1.5 / 22	4.1 / 11	6.8 / 7

times are rounded up to next whole $\frac{1}{10}$ second

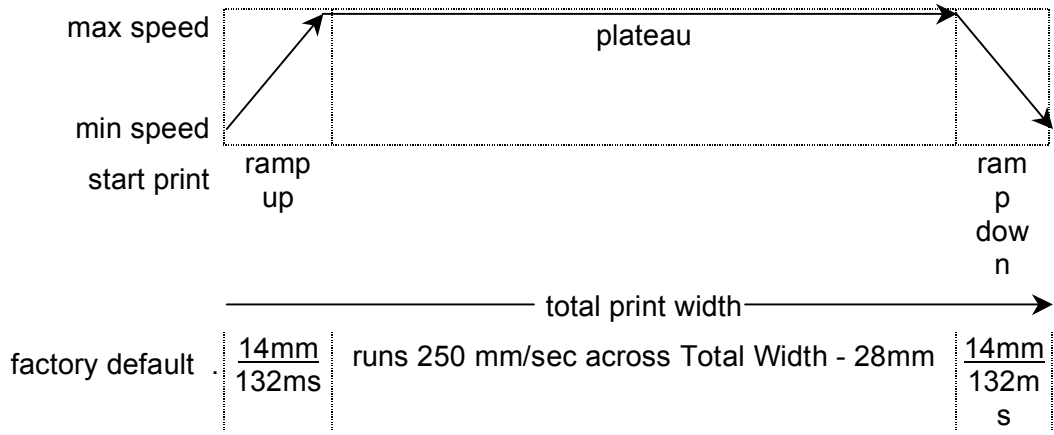
For high speed applications, 128 mm (5") printer - 300 mm/sec

Dwell time in secs / Cycle Rate per min...

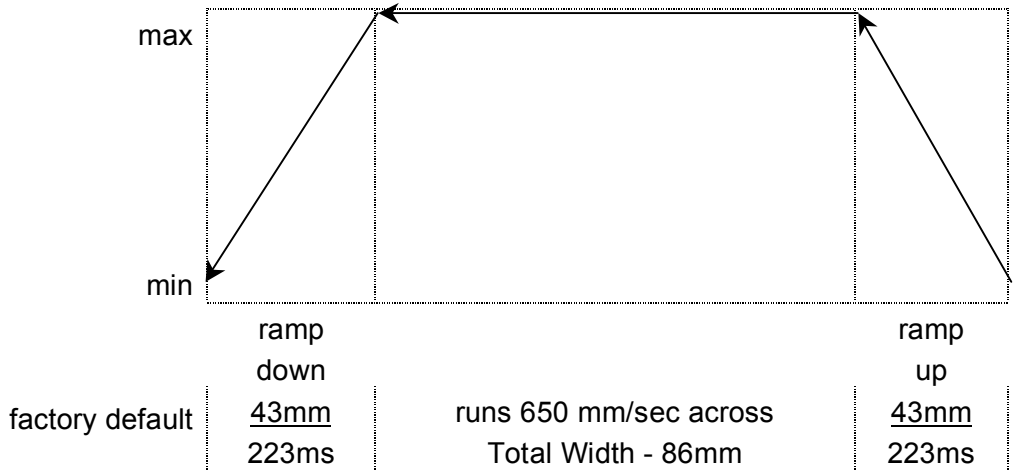
rows print width	1 (no minor index)	2	3
254 mm (10")	1.1 / 35	2.8 / 17	4.5 / 12
440 mm	1.7 / 23	4.3 / 11	6.9 / 8
600 mm	2.2 / 18	5.6 / 9	9.0 / 6

times are rounded up to next whole $\frac{1}{10}$ second

Print (fwd)



Carriage Return (rev)



OFFSET FEATURE

Background:

During changeover, it is currently necessary to re-register the print by manually unlocking, adjusting, and relocking the MLP registration roller. Further, it is necessary for the operator to enter new length & row parameters into the WAS system. The original registration adjustment (built into the MLP) is designed for occasional changeovers. For applications where it will be more commonplace to do job changeovers and thus registration re-adjustments, the process should be more friendly, precise, and even automatic.

Print registration is directly affected by 2 things:

- the MLP registration roll position
- the WAS roller shuttle position

Goal:

To provide a printing and web advance system that possesses automatic features so manual adjustments by the operator are not required for job changeovers. The automatic features shall achieve precision to within 1 millimeter.

Principles of Operation:

1. The existing registration roller of the MLP will serve as a one-time initial adjustment. This can be called the "origin".
2. Thereafter, different registration adjustments shall be able to be done automatically by the WAS system. Further, length and row parameters can also be automatically recalled.
3. The WAS program will accommodate 8 recipes
4. It will be necessary for the user to initially program a set of parameters into the WAS, each recipe corresponding to each job requirement:
 - a. Total Index length (mm)
 - b. Number of rows (6 max)
 - c. Home offset (mm) - refers to the position of the WAS roller shuttle
 - d. Once the parameters are stored in the WAS, a job recipe can be automatically recalled using electrical interface signals from the packaging machine.
 - e. Three inputs are provided:
 - i. connected to potential-free contacts in the packaging machine
 - ii. open circuit potential from the WAS = 24VDC
 - iii. closed circuit current = not to exceed 50ma (typically 10ma)
 - iv. binary combination of the lines allow one of 8 recipes to be recalled.
 - v. it is allowable not to connect all 3 inputs if fewer recipes are needed.
5. The packaging machine program must be revised to control up to 3 output lines to signal to the WAS 1 of 8 recipes available in the WAS.

6. Response of the WAS to the signals from the packaging machine is immediate. Thus the input signals from the packaging machine should be held constant throughout the duration of the job.
7. The maximum range of web movement by the WAS is 300 mm. So the distance from the origin position to the farthest "last row" print position in any job must not exceed 300 mm.

WEB ADVANCE SYSTEM PLC I/O ASSIGNMENTS

Mitsubishi FX1S

PLC INPUT/OUTPUT ASSIGNMENTS

For PLC Programs v2.2 and later without Slot Sensor

AND

For PLC Programs **WAS-UNI v1.0 or later**

Inputs Current Sinking

- X0** Guard safety switch circuit
- X1** not used
- X2** Print command signal (from host machine)
- X3** Enable printer system (from host machine)
- X4** not used
- X5** not used
- X6** MLP Ready signal (from MLP)
- X7** Over-travel limit sensor (opposite home)
- X10** Drive over-temperature
- X11** Over-travel limit sensor (near home)
- X12** Test Stand Active (used on test stand only)
- X13** not used

Outputs Current Sinking

- Y0** Pulse output (to stepper drive)
- Y1** Motor direction (Y1=ON, motor goes toward home)
- Y2** not used
- Y3** System Ready Relay R1 (to host machine)
- Y4** not used
- Y5** Print signal R2 (to MLP)
- Y6** Die Count reset (to MLP through WAS machine interface)
- Y7** Nip roll output (used on test stand only)

SPARE PARTS

In order to insure the continuous operation of your WEB ADVANCE SYSTEM, it is suggested that you have on hand the following parts to prevent downtime.

Recommended Spare Parts:

1	P11563	PROXIMITY SENSOR
3	P11624	FUSE, 4A 5x20mm
1	P11586	RELAY
2	P11343	JUMPER
1	EY1052	GUARD SWITCH ASSY
1 (630mm)	P10423...OR	DRIVE BELT
1 (440mm)	P41024	DRIVE BELT